

What is Claimed:

1 1. A scrambling method for scrambling UWB (ultra wideband) data,
2 the method comprising the steps of:

3 shifting a first bit string a first number of bits;

4 shifting a second bit string a second number of bits;

5 combining the first and second shifted bit strings;

6 generating scrambler control bits from the combined first and second
7 shifted bit strings; and

8 scrambling at least a portion of the UWB data responsive to the
9 generated scrambler control bits.

1 2. The method of claim 1, further including where the first bit string
2 and the second bit string are randomly initialized.

1 3. The method of claim 2, wherein the first bit string and second bit
2 strings are randomly initialized using a pseudo random sequence.

1 4. The method of claim 2, wherein the first bit string and second bit
2 strings are randomly initialized using a random sequence.

1 5. The method of claim 1, wherein the scrambling method for
2 scrambling UWB data is applied to each frame.

1 6. The method of claim 1, wherein the UWB data includes payload
2 and non-payload data and the scrambling step scrambles the payload data.

1 7. The method of claim 6 wherein the method further comprises the
2 step of:

3 selectively applying random frame reversion to the non-payload data.

1 8. The method of claim 7 wherein the step of selectively applying
2 random frame reversion to the non-payload data includes the steps of:

3 generating a pseudo random sequence with an evenly distributed
4 function;

5 selectively inverting a data sequence responsive to the pseudo random
6 data sequence.

1 9. A scrambling method for scrambling ultra wideband (UWB) data
2 having payload data and non-payload data, the method comprising the steps of:

3 scrambling the payload data using a pseudo random sequence configured
4 for initialization using a seed set with substantially uncorrelated seed values; and
5 selectively applying random frame reversion to the non-payload data.

1 10. The method of claim 9 wherein the step of selectively applying
2 random frame reversion to the non-payload data includes the steps of:

3 generating a random sequence with an evenly distributed function;
4 selectively inverting a data sequence responsive to the random data
5 sequence.

1 11. A scrambler for scrambling UWB data, the scrambler comprising:
2 a first shift register to shift a first bit string a first number of bits;
3 a second shift register to shift a second bit string a second number of
4 bits;
5 a combining circuit to combine the first and second shifted bit strings;
6 a third shift register to load the combined first and second shifted bit
7 strings; and
8 a control circuit to generate scrambler control bits from the combined
9 first and second shifted bit strings for scrambling at least a portion of the UWB data.

1 12. The scrambler of claim 11, further including a polynomial
2 generator which produces a pseudo random sequence to initialize the first bit string and
3 the second bit string.

1 13. The scrambler of claim 12, wherein the random sequence
2 produced by the polynomial generator is greater than or equal to 15 bits.

1 14. The scrambler of claim 11, wherein the first shift register and the
2 second shift registers are initialized responsive to a new frame.

1 15. The scrambler of claim 14, wherein each frame of the UWB data
2 includes payload and non-payload data and the scrambler further comprises:

3 a selective random frame reversion circuit for selectively inverting at
4 least the non-payload data of each scrambled frame.

1 16. The scrambler of claim 15 wherein the selective random frame
2 reversion circuit comprises:

3 a random sequence generator to generate a pseudo random data
4 sequence with an evenly distributed function; and
5 an inverter to selectively invert a data sequence responsive to the pseudo
6 random data sequence.

1 17. A scrambler system for data whitening to reduce the PSD (power
2 spectral density) of (ultra wide-band) UWB signals having payload data and non-
3 payload data, the scrambler system comprising:

4 a scrambler configured to scramble the payload data, the scrambler
5 comprising a linear feedback shift register configured for initialization using a seed set
6 with substantially uncorrelated seed values; and

7 a selective random frame reversion circuit configured to selectively invert
8 the non-payload data.

1 18. The scrambler of claim 17, wherein the seed set includes at least
2 4 seed values and wherein the seed value within the seed set has at least 16 bits.

1 19. The scrambler of claim 17 wherein the selective random frame
2 reversion circuit includes:

3 a random sequence generator to generate a pseudo random sequence
4 with an evenly distributed function; and

5 an inverter to invert a data sequence responsive to the random data
6 sequence.

1 20. A computer readable carrier, including software that is configured
2 to control a computer to implement a scrambling method for scrambling UWB data, the
3 method including the steps of

4 shifting a first bit string a first number of bits;

5 shifting a second bit string a second number of bits;

6 combining the first and second shifted bit strings;

7 generating scrambler control bits from the combined first and second
8 shifted bit strings; and

9 scrambling at least a portion of the UWB data responsive to the
10 generated scrambler control bits.

- 1 21. A computer readable carrier including software that is configured
- 2 to control a computer to implement a scrambling method for scrambling UWB data
- 3 having payload data and non-payload data, the method comprising the steps of:
- 4 scrambling the payload data using a pseudo random sequence configured
- 5 for initialization using a seed set with substantially uncorrelated seed values; and
- 6 selectively applying random frame reversion to the non-payload data,
- 7 random frame reversion including the steps of:
- 8 generating a random sequence with an evenly distributed function;
- 9 selectively inverting a data sequence responsive to the random data
- 10 sequence; and
- 11 transmitting the selectively inverted data sequence.